Parking Garage Structural Testing Results and Survey Report

Vientiane, Laos

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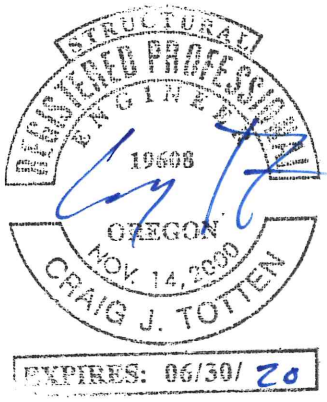

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SECTION 030130 - MAINTENANCE OF CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Epoxy crack injection.

1.3 UNIT PRICES

A. General: Unit prices include the cost of preparing existing construction to receive the work indicated and costs of field quality control required for units of work completed.

B. Epoxy Crack Injection: Work will be paid for by the linear meter (linear foot) of crack injected.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct on site conference prior to beginning work.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, chemical composition, physical properties, test data, and mixing, preparation, and application instructions.

B. Equipment for Injection: For each piece of equipment used to meter and mix epoxy injection adhesive components and inject the mixed adhesive into the cracks.

C. Substitution Requests: For manufacturers and products not listed in Part 2, provide Substitution Request Form with complete technical product data, warranty, cost comparison information, and explanation of how this substitution product either matches or exceeds the performance of the Basis of Design product.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installers, manufacturers and testing agency.

1. For products required to be installed by workers approved by product manufacturers, include letters of acceptance by product manufacturers certifying that installers are approved to apply their products.

B. Product Test Reports: For each crack injection adhesive, for tests performed by manufacturer and witnessed by a qualified testing agency.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Each crack-injection-adhesive manufacturer shall employ factory-trained technical representatives who are available for consultation and project-site inspection and assistance at no additional cost.

B. Installer Qualifications: Epoxy injection shall be performed by an experienced installer, with documented jobs of a similar nature. The company must have a minimum of 5 years experience and 50 documented jobs.

C. Workman’s Qualifications: Contractor’s/Subcontractor’s workmen engaged in the epoxy injection process shall have satisfactorily completed a program of instruction in the methods of restoring concrete structures utilizing the specific epoxy injection process indicated. A certificate of complete by each workman shall be part of the submittal requirements. The curriculum shall include theory on the nature and causes of cracking in concrete, methods for permanently repairing damaged concrete structures, the technical aspects of correct material selection and use, and the operation, maintenance and troubleshooting of equipment. Additionally, they must have a minimum of 5 years experience and 50 documented project totaling no less than 1,525 lineal meter (5,000 lineal feet) of successful crack injection.

D. Source Limitations: Obtain epoxy crack injection materials through one source from a single manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in manufacturer's original and unopened containers, labeled with type and name of products and manufacturers.

B. Comply with manufacturer's written instructions for minimum and maximum temperature requirements and other conditions for storage.

1.9 FIELD CONDITIONS

A. Environmental Limitations for Epoxies: Do not apply when air and substrate temperatures are outside limits permitted by manufacturer. During hot weather, cool epoxy components before mixing, store mixed products in shade, and cool unused mixed products to retard setting. Do not apply to wet substrates unless approved by manufacturer.

1. Use only Class A epoxies when substrate temperatures are below or are expected to go below 5 deg C (40 deg F) within 8 hours.
2. Use only Class A or B epoxies when substrate temperatures are below or are expected to go below 16 deg C (60 deg F) within 8 hours.
3. Use only Class C epoxies when substrate temperatures are above and are expected to stay above 16 deg C (60 deg F) for 8 hours.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations: Obtain each color, grade, finish, type, and variety of product from single source with resources to provide products of consistent quality in appearance and physical properties.

B. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.

2.2 EPOXY CRACK-INJECTION MATERIALS

A. Structural Epoxy - Epoxy Crack-Injection Adhesive: ASTM C 881/C 881M, Type IV, free of VOCs.
1. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:

a. BASF Construction Chemicals - Building Systems: MasterInject 1500
b. Euclid Chemical Company (The); an RPM company: EUCO #452 Epoxy LV
c. Sika Corporation; Construction Product Division: Sikadur-35 Hi-Mod LV

2. Capping Adhesive: Product manufactured for use with crack injection adhesive by same manufacturer.

B. Flexible Sealant – Elastomeric Joint Sealant: ASTM C 920/C 920M, Grade NS
1. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following:
a. BASF Construction Chemicals – Building Systems: MasterSeal CR 195

b. Euclid Chemical Company (The); an RPM company: Eucolastic 1NS
c. Sika Corporation; Construction Product Division: Sikaflex-2c NS TG

2.3 EQUIPMENT FOR INJECTION

A. Equipment for Epoxy Crack Injection: The equipment used to meter and mix the two injection adhesive components and inject the mixed adhesive into the crack shall be portable, variable pressure, positive displacement type pumps that provide positive ratio control of exact proportions of the two components at the nozzle. The pumps shall be electric or air powered and shall provide in-line metering and mixing.

B. Discharge Control Equipment: The injection equipment shall have automatic pressure control capable of discharging the mixed adhesive at any pre-set pressure up to 1380kPa (200 psi).

C. Ratio Control Equipment: The equipment shall have the capability of maintaining the volume ratio for the injection adhesive prescribed by the manufacture of the adhesive within a tolerance of +5% by volume at any discharge pressure up to 1380kPa (200 psi).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Locate areas of concrete with cracks exceeding those prescribed in this specification.

3.2 PREPARATION

A. Ensure that supervisory personnel are on-site and on duty when concrete maintenance work begins and during its progress.

B. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from concrete maintenance work.

1. Comply with each product manufacturer's written instructions for protections and precautions. Protect against adverse effects of products and procedures on people and adjacent materials, components, and vegetation.
2. Use only proven protection methods appropriate to each area and surface being protected.
3. Contain dust and debris generated by concrete maintenance work and prevent it from reaching the public or adjacent surfaces.
4. Use water-mist sprinkling and other wet methods to control dust only with adequate, approved procedures and equipment that ensure that such water will not create a hazard or adversely affect other building areas or materials.
5. Protect floors and other surfaces along haul routes from damage, wear, and staining.

6. Protect adjacent surfaces and equipment by covering them with heavy polyethylene film and waterproof masking tape. If practical, remove items, store, and reinstall after potentially damaging operations are complete.
7. Dispose of debris and runoff from operations by legal means.

3.3 APPLICATION

A. General: Comply with manufacturer's written instructions and recommendations for application of products, including surface preparation.

B. Epoxy Crack Injection:

1. Clean areas to receive capping adhesive of oil, dirt, and other substances that would interfere with bond, and clean cracks with oil-free compressed air or low-pressure water to remove loose particles.
2. Place injection ports as recommended by epoxy manufacturer, spacing no farther apart than thickness of member being injected. Seal injection ports in place with capping adhesive.
3. Surface seal material shall be applied to the face of the crack between the entry ports. For through cracks, surface seal shall be applied to both faces whenever possible. Surface seal material shall gain adequate strength before proceeding with pressure injecting the adhesive.
4. Inject cracks where indicated on the drawings.
5. Inject epoxy adhesive, beginning at widest part of crack and working toward narrower parts. Inject adhesive into ports to refusal, capping adjacent ports when they extrude epoxy. Cap injected ports and inject through adjacent ports until crack is filled. If port to port travel of epoxy adhesive is not indicated, the work shall immediately be stopped and the Engineer notified.
6. After epoxy adhesive has set, remove injection ports and grind surfaces smooth.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections:

1. Pressure Test of Injection Equipment:

a. Method: The mixing head of the injection equipment shall be disconnected and the two-component adhesive delivery lines shall be attached to the pressure check device. The pressure check device shall consist of two independent valved nozzles capable of controlling flow rate and pressure by opening or closing the valve. There shall be a pressure gauge capable of sensing the pressure build-up behind each valve. The valves on the pressure check device shall be closed and the

equipment operated until the gauge pressure on each line reads 1100 kPa (160 psi). The pumps shall be stopped and the gauge pressure shall not deviate 35 kPa (5 psi) within 3 minutes.

b. Testing Frequency: The pressure test shall be run for each injection unit at the beginning and after meal break of every shift that the unit is used in the work of crack repair, or if there may be reason to suspect malfunction of the equipment.

2. Ratio Test of Injection Equipment:

a. Method: The mixing head of the injection equipment shall be disconnected and the two adhesive components shall be pumped simultaneously through the ratio check device. The ratio check device shall consist of two independent valved nozzles capable of controlling back pressure by opening and closing the valve.

There shall be a pressure gauge capable of sensing the back pressure behind each valve. The discharge pressure shall be adjusted to 1100 kPa (160 psi) for both adhesive components. Both adhesive components shall be simultaneously discharged into separate calibrated containers. The amounts discharged into the calibrated containers simultaneously during the same time period shall be compared to determine that the volume/discharge conforms to the manufacturer's recommended ratio for applicable material.

Testing Frequency: The ratio test shall be run for each injection unit at the beginning and after meal break of every shift that the unit is used in the work of crack repair, or if there may be reason to suspect malfunction of the equipment.

C. Product will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports. Contractor shall keep complete and accurate records available on-site.

END OF SECTION 030130

SECTION 071800 - TRAFFIC COATINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes traffic coatings for the following applications:
   1. Exterior vehicular traffic.
   2. Wheel stops.
   3. Pavement Marking.

B. Requirements specified are for vehicular traffic “Heavy Duty” system, unless otherwise specifically indicated. Submittals apply to each system separately; Performance Requirements and Warranties apply to both systems.

1.2 SUBMITTALS

A. Product Data: For each product indicated. Include ASTM C 1127 “Standard Guide for Use of High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane with an Integral Wearing Surface” current as of contract date.

B. Shop Drawings: Show extent of each traffic coating. Include details for treating substrate joints and cracks, flashings, deck penetrations, and other termination conditions.

C. Samples for Initial Selection: For each type of finish indicated.

D. Samples for Verification: For each type of traffic coating required, prepared on rigid backing and of same thickness and material indicated for the Work.

   1. Provide stepped Samples on backing large enough to illustrate buildup of traffic coatings.

E. Material Test Reports: From a qualified independent testing agency indicating and interpreting test results for compliance of traffic coatings with requirements, based on comprehensive testing of current product formulations within the last three years as required by ASTM C1127 Paragraph 12.1.2. Where specified, submit with sub-bids.

F. Material Certificates: Signed by manufacturer certifying that traffic coatings comply with requirements, based on comprehensive testing of current product formulations within the last three years.

G. Maintenance Data: For traffic coatings to include in maintenance manuals. Identify substrates and types of traffic coatings applied. Include recommendations for periodic inspections, cleaning, care, maintenance, and repair of traffic coatings.

H. Substitution Requests: For manufacturers and products not listed in Part 2, provide Substitution Request Form with complete technical product data, warranty, cost comparison information, and explanation of how this substitution product either matches or exceeds the performance criteria of the Basis of Design product.

1. Include independent test report (of any age) and list of comparable projects (top deck of parking structure) over 5 years old with system proposed for this work, including names and phone numbers of Owner and C.O.R..

I. Warranty: Special warranty specified in this Section.

1.3 QUALITY ASSURANCE

A. Source Limitations:

1. Obtain traffic coatings from a single manufacturer.
2. Obtain primary traffic coating materials, including primers, from traffic coating manufacturer. Obtain secondary materials including aggregates, sheet flashings, joint sealants, and substrate repair materials of type and from source recommended in writing by primary material manufacturer.

B. Mockups: Apply mockups to set quality standards for materials and execution.

1. C.O.R. will select one representative surface for each traffic coating and each substrate to receive traffic coatings. Apply each coating to at least 200 sq. ft. of each substrate to demonstrate surface preparation, joint and crack treatment, thickness, texture, color, and standard of workmanship.
2. Remove and reapply mockups until they are approved by C.O.R..
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1. Before installing traffic coatings, meet with representatives of authorities having jurisdiction, manufacturer's technical representative, Owner, C.O.R., consultants, independent testing agency, and other concerned entities. Review requirements for traffic coatings. Notify participants at least seven days before conference.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels showing the following information:

1. Manufacturer's brand name.
2. Type of material.
3. Directions for storage.

4. Date of manufacture and shelf life.
5. Lot or batch number.
6. Mixing and application instructions.
7. Color.

B. Store materials in a clean, dry location protected from exposure to direct sunlight. In storage areas, maintain environmental conditions within range recommended in writing by manufacturer.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Apply traffic coatings within the range of ambient and substrate temperatures recommended in writing by manufacturer. Do not apply traffic coatings to damp or wet substrates, when temperatures are below 40 deg F, when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F above dew point.

1. Do not apply traffic coatings in snow, rain, fog, or mist, or when such weather conditions are imminent during the application and curing period. Apply only when frost-free conditions occur throughout the depth of substrate.

B. Do not install traffic coating until items that will penetrate membrane have been installed.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which traffic coating manufacturer agrees to repair or replace traffic coatings that deteriorate during the specified warranty period. Warranty does not include deterioration or failure of traffic coating due to unusual weather phenomena, failure of prepared and treated substrate, formation of new substrate cracks exceeding 1/16 inch in width, fire, vandalism, or abuse by snowplow, maintenance equipment, and truck traffic.

1. Deterioration of traffic coatings includes the following:

a. Adhesive or cohesive failures.
b. Abrasion or tearing failures.
c. Surface crazing or spalling.
d. Intrusion of water, oils, gasoline, grease, salt, deicer chemicals, or acids into deck substrate.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Traffic Coatings: Complying with ASTM C 957.

B. Material Compatibility: Provide primers; base, intermediate, and topcoats; and miscellaneous materials that are compatible with one another and with substrate under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

2.2 TRAFFIC COATING

A. Basis of Design Product: The requirements for "Heavy Duty" (Type 1) traffic coating is based on Vulkem 350NF/345NF/346NF (neighbor friendly) System; Tremco Inc. Subject to compliance with requirements, provide the product named above or one of the following:

1. Heavy Duty Vehicular Traffic Deck System CCW-5123-HD; Carlisle Coatings & Waterproofing, Inc.

    a. Provide low odor formulation.
    b. With sub-bids, submit the following: Independent test report (of any age) and list of comparable projects (top deck of parking structure) over 5 years old with system proposed for this work, including names and phone numbers of Owner and C.O.R..

2. LymTal International, Inc.; IsoFlex.

    a. Provide low odor formulation.
    b. With sub-bids, submit the following: Independent test report (of any age) and list of comparable projects (top deck of parking structure) over 5 years old with system proposed for this work, including names and phone numbers of Owner and C.O.R..

3. Koba Thane Traffic Topping System; General Polymers.

    a. Provide low odor formulation.
    b. With sub-bids, submit the following: Independent test report (of any age) and list of comparable projects (top deck of parking structure) over 5 years old with system proposed for this work, including names and phone numbers of Owner and C.O.R..

4. Auto-Gard 7400.02 Series System; Neogard.

    a. Provide low odor formulation.
    b. With sub-bids, submit the following: Independent test report (of any age) and list of comparable projects (top deck of parking structure) over 5 years old with system proposed for this work, including names and phone numbers of Owner and C.O.R..

5. Sonoguard Heavy Duty traffic Coating System; Sonneborn, Div. of BASF.

    a. Provide low odor formulation.
    b. With sub-bids, submit the following: Independent test report (of any age) and list of comparable projects (top deck of parking structure) over 5 years old with system proposed for this work, including names and phone numbers of Owner and C.O.R..

6. Pro-Deck TDC System; Stellar-Mark.

a. Provide low odor formulation.
b. With sub-bids, submit the following: Independent test report (of any age) and list of comparable projects (top deck of parking structure) over 5 years old with system proposed for this work, including names and phone numbers of Owner and C.O.R..

7. Dex-O-Tex Auto-Dex 500 System; Dex-O-Tex/Crossfield Products Corp.

a. Provide low odor formulation.
b. With sub-bids, submit the following: Independent test report (of any age) and list of comparable projects (top deck of parking structure) over 5 years old with system proposed for this work, including names and phone numbers of Owner and C.O.R..

B. Primer: Manufacturer's standard factory-formulated primer recommended for substrate and conditions indicated.

1. Material: Epoxy or Urethane.

C. Preparatory and Base Coats: Single- or multicomponent, aromatic liquid urethane elastomer.

D. Intermediate Coat: Single- or multicomponent, aromatic liquid urethane elastomer.

E. Topcoat: Single- or multicomponent, aromatic liquid urethane elastomer.

1. Color: Tremco “Limestone”.

F. Component Coat Thicknesses: As recommended by manufacturer for substrate and service conditions indicated, but not less than the following (measured excluding aggregate):

1. Base Coat: 22 mil wet film thickness, minimum (15 mil at “Light Duty” systems).
2. Intermediate Coat: 20 mil wet film thickness, minimum (not used at “Basis of Design” system; optional for “Light Duty” systems).
3. Top Coat: 28 mil wet film thickness, minimum.
4. Coats may be merged where documented by independent test report and confirmed with historical data.

G. Aggregate: Uniformly graded, washed silica sand of particle sizes, shape, and minimum hardness recommended in writing by traffic coating manufacturer.

1. Spreading Rate: As recommended by manufacturer for substrate and service conditions indicated, but not less than the following:

a. Intermediate Coat: 8 to 10 lb/100 sq. ft., to refusal.
b. Topcoat: 8 to 10 lb/100 sq. ft. or more as required to achieve slip-resistant finish.
c. Aggregate applications may be combined where standard with manufacturer.

2.3 PAVEMENT MARKINGS

A. Pavement-Marking Paint: Alkyd-resin ready mixed, complying with AASHTO M 248, Type F.

1. Color: White.

    a. Use blue for spaces accessible to people with disabilities.

2.4 MISCELLANEOUS MATERIALS

A. Joint Sealants: Multicomponent urethane sealant recommended in writing by manufacturer for substrate and joint conditions indicated and for compatibility with traffic coatings; complying with ASTM C 920, Type M, Class 25, Grade NS for sloping and vertical applications or Grade P for deck applications, and Use T where subject to traffic or Use NT elsewhere.

B. Adhesive: Contact adhesive recommended in writing by traffic coating manufacturer.

C. Reinforcing Strip: Fiberglass mesh recommended in writing by traffic coating manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements and for other conditions affecting performance of traffic coatings.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.
2. Verify compatibility with and suitability of substrates.
3. Begin coating application only after minimum concrete curing and drying period recommended by traffic coating manufacturer has passed, after unsatisfactory conditions have been corrected, and after surfaces are dry.
4. Verify that substrates are visibly dry and free of moisture.

    a. Test for moisture vapor transmission by plastic sheet method according to ASTM D 4263.
    b. Test for moisture content by method recommended in writing by manufacturer.

5. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Clean and prepare substrates according to ASTM C 1127 and manufacturer's written recommendations to produce clean, dust-free, dry substrate for traffic coating application.

B. Mask adjoining surfaces not receiving traffic coatings, deck drains, and other deck substrate penetrations to prevent spillage, leaking, and migration of coatings.

C. Concrete Substrates: Mechanically abrade concrete surfaces to a uniform profile according to ASTM D 4259. Do not acid etch.

1. Remove grease, oil, paints, and other penetrating contaminants from concrete.
2. Remove concrete fins, ridges, and other projections.
3. Remove laitance, glaze, efflorescence, curing compounds, concrete hardeners, form-release agents, and other incompatible materials that might affect coating adhesion.
4. Remove remaining loose material to provide a sound surface, and clean surfaces according to ASTM D 4258.

3.3 TERMINATIONS AND PENETRATIONS

A. Prepare vertical and horizontal surfaces at terminations and penetrations through traffic coatings and at expansion joints, drains, and sleeves according to ASTM C 1127 and manufacturer's written recommendations.

B. Provide sealant cants at penetrations and at reinforced and nonreinforced, deck-to-wall butt joints.

C. Terminate edges of deck-to-deck expansion joints with preparatory base-coat strip.

D. Install sheet flashings at deck-to-wall expansion and dynamic joints, and bond to deck and wall substrates according to manufacturer's written recommendations.

3.4 JOINT AND CRACK TREATMENT

A. Prepare, treat, rout, and fill joints and cracks in substrates according to ASTM C 1127 and manufacturer's written recommendations. Before coating surfaces, remove dust and dirt from joints and cracks according to ASTM D 4258.

1. Comply with recommendations in ASTM C 1193 for joint-sealant installation.

3.5 TRAFFIC COATING APPLICATION

A. Apply traffic coating material according to ASTM C 1127 and manufacturer's written recommendations.

1. Start traffic coating application in presence of manufacturer's technical representative.
2. Verify that wet film thickness of each component coat complies with requirements every 100 sq. ft.

B. Apply traffic coatings to prepared wall terminations and vertical surfaces to height 4-inches above finished floor and omit aggregate on vertical surfaces.

C. Cure traffic coatings according to manufacturer's written recommendations. Prevent contamination and damage during application and curing stages.

3.6 WHEEL STOPS

A. Carefully remove existing wheel stops and store for re-use. Once traffic coating and pavement markings are complete, securely re-install stored wheel stops to pavement using adhesive. Wheel stops damaged during removal or storage shall be replaced in kind by the contractor at no cost to the government.

3.7 FIELD QUALITY CONTROL

A. Final Traffic Coating Inspection: Arrange for traffic coating manufacturer's technical personnel to inspect membrane installation on completion.

1. Notify COR 48 hours in advance of date and time of inspection.

B. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

1. Testing Agency shall test thickness of coating and perform an adhesion pull test.

C. Waterproofing will be considered defective if it does not pass tests and inspections.

3.8 PAVEMENT MARKINGS

A. Do not apply traffic paint for striping and other markings until traffic coating has cured according to manufacturer's written recommendations.

B. Apply traffic paint for striping and other markings with mechanical equipment to produce uniform straight edges. Apply at manufacturer's recommended rates for a 15-mil- minimum wet film thickness.

3.9 PROTECTING AND CLEANING

A. Protect traffic coatings from damage and wear during remainder of construction period.

B. Clean spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 071800